NAME = IMAD AHMAD

ID = 16082

SECTION= A

DEPARTMENT= BS CIVIL

SUBJECT = CONCRET TECHNOLOGY

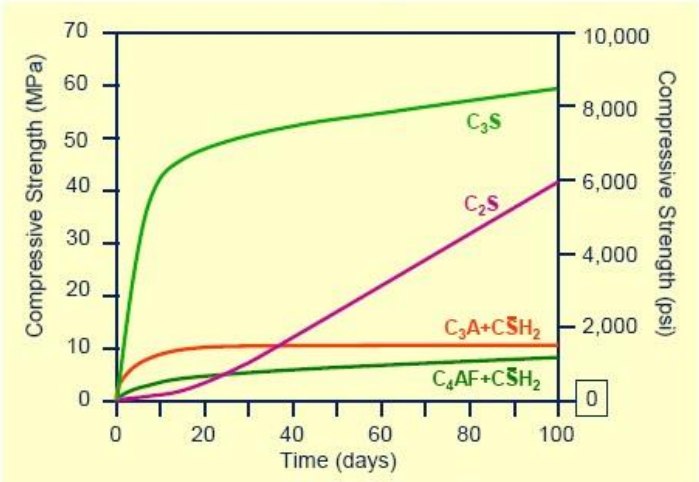
Q1: Which step is taken to prevent flash setting of cement? Also, write steps to prevent false setting of concrete.

Answer: Gypsum is added to Portland cement to prevent early hardening or **flash setting**, allowing a longer working time. Gypsum slows down the setting of cement so that cement is adequately hardened. Calcium Hydroxide binds the silicate participles together, Aluminum Hydroxide fills the space in the lattice.

A false set is when cement stiffens within a few minutes of being mixed, without the evolution of much heat. This can be caused by the cement being exposed to humidity during storage. It can be fixed at the job site by vigorously remixing the paste, without adding any additional water.

Q2: Draw a graph showing the strength development of pure compounds of cement.

Answer: Following is the graphs representing the strength development of cement.

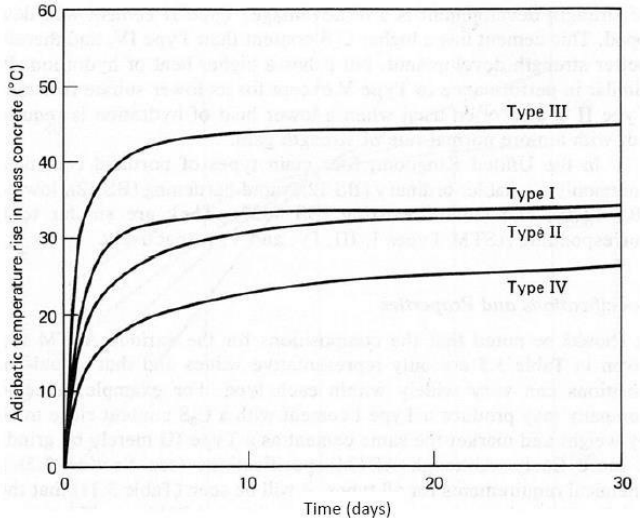


Graph: Strength Development of Cement

Q3: Why Type-III cement is rapid hardening & type-IV Low heat producing? Draw a graph showing the development of heat of hydration of different cement types.

Answer: Type-III cement is rapid hardening due to excess amount of C_3S. Type-IV is low heat producing due to low content of C_3S (<50%) & C_3A. Tri calcium silicate plays the major role.

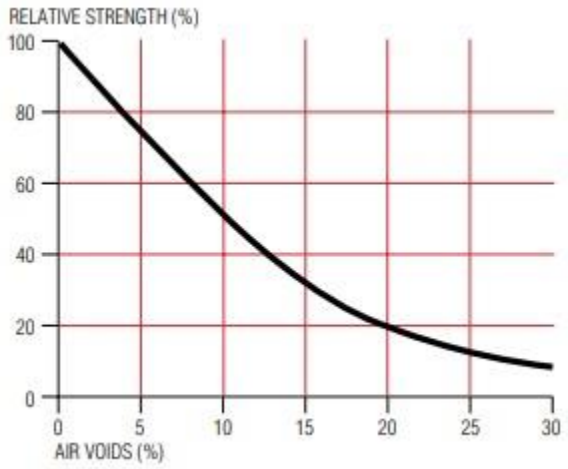
Graph showing the development of heat of hydration of different types of cement is given below.



Graph: Heat of Hydration of different types

Q4: What is the effect of compaction on entrapped air of concrete? What will be the effect on strength if concrete is not compacted sufficiently? Explain with graph.

Answer: Compaction is inversely proportional to air trapped air of concrete. Air voids in concrete decreases with appropriate compaction which is usually carried out by Vibrator on construction sites.



Graph: Loss of strength due to incomplete compaction

As it may be seen from graph, the effect of compaction on compressive strength is dramatic. The strength of concrete containing 10% of entrapped air (air voids) is as little as 50% that of the concrete when fully compacted.

Q5: Why is the percentage of Gypsum added to cement limited only to 5%?

Answer: C_3A hydration has a minor effect on setting time of cement. The main purpose of adding gypsum in the cement is to slow down the hydration process of cement once it is mixed with water. The amount of gypsum added depends on the characteristic of cement required. Therefore, maximum 5% of Gypsum is added to serve the purpose.

Q6: What is the effect of following on bond strength of concrete

i. Shape of Aggregate ii.
Size of Aggregate iii.
Texture of Aggregate iv.
Bleeding

Answer:

i. Shape of Aggregate:

The shape and texture of aggregate affects the properties of fresh concrete more than hardened concrete. An irregular shape of aggregate creates a better bond between the paste and the aggregate presenting a better strength.

ii. Size of Aggregate:

The tensile strength of the concrete is severely affected by increasing the size of the aggregate. On increasing the maximum grain size to 120–180 mm, the reduction in tensile strength is 30–50% as compared with concretes with maximum aggregate size of 20 mm

iii. Texture of Aggregate:

The shape and texture of aggregate affects the properties of fresh concrete more than hardened concrete. A smooth surface can improve workability, yet a rougher surface generates a stronger bond between the paste and the aggregate creating a higher strength iv. Bleeding:

Bleeding is responsible for causing permeability in concrete. In the process of bleeding the accumulation of water creates a water voids and reduces bond between the aggregate and cement paste

Q7: What is the effect of following on workability of concrete?

i- Porosity & absorption ii- Air entraining agent
iii- Coarse aggregate to fine aggregate ratio iv- Grading of aggregate

Answer:

i- Porosity & absorption:

The porosity & absorption of an aggregate also affect workability of concrete. If the aggregate can absorb a great deal of water, less will be available to provide workability

ii- Air entraining Agent:

Air entraining agent increases the workability of concrete without much increase in water-cement ratio. In this case, air entraining admixture is added to increase workability without adding water.

iii- Coarse aggregate to fine aggregate ratio:

An increase in the coarse aggregate ratio will decrease workability. A fine aggregate deficiency results in a mixture that is harsh, prone to segregation, and difficult to finish. On the contrary, an excess of fine aggregate will lead to some extent more permeable and less economical concrete, although the mixture will be easily workable

iv- Grading of aggregate:

Grading of aggregates have the maximum effect on the workability of concrete. A well graded aggregates have all sizes in required percentages. This helps in reducing the voids in a given volume of aggregates. With less volume of voids, the aggregate particles slide past each other and less compacting effort is required for proper consolidation of aggregates.

Q8: What is the effect of fineness of cement on the following?

i- Strength of concrete
ii- Rate of heat evaluation during hydration
iii- Total heat of hydration iv- Workability of concrete

Answer:

i- Strength of concrete:

The 28-day compressive strength of concrete, with or without entrained air, increases with an increase in cement fineness

ii- Rate of heat evaluation during hydration:

Finer cement offers a greater surface area for hydration and hence rate of heat evaluation during hydration increases with fineness of cement

iii- Total heat of hydration:

The size of cement particles directly affects heat of hydration. Larger size leads to larger total heat of hydration

iv- Workability of concrete

The workability of non air-entrained concrete is increased by increasing the cement fineness.

Q9: What steps should be taken during transportation & placement of concrete to prevent segregation of concrete?

Answer: Steps to prevent Segregation:

i- Use of air entraining agents ii- Use of admixtures
iii- Pozzolanic materials can be used

iv- Care should be taken while transporting concrete. It should be mixed continuously while transporting to a far off area in transit mixture depending on the circumstances to prevent segregation